NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION WATER CONVEYANCE PORTABLE ALUMINUM TUBING PIPELINE

(Ft.)
CODE 430XX

DEFINITION

A pipeline and appurtenances installed in an irrigation system.

PURPOSE

To prevent erosion or loss of water quality or damage to land and to reduce water conveyance losses to make possible the proper management of irrigation water.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to aluminum irrigation tubing, 12-inch nominal diameter or less, that is considered portable. This practice standard is applicable when significant amounts of bedrock exist prohibiting the economical installation of a buried pipeline.

The pipeline shall be planned and located to serve as an integral part of an irrigation water distribution or conveyance system that has been designed to help conserve soil and water resources on a farm.

Water quality, seasonal supplies and rates of irrigation delivery for the area served by the pipeline shall be sufficient to make irrigation practical for the methods to be used.

CRITERIA

All planned work shall comply with all federal, state and local laws, rules and regulations.

Working pressure. The maximum design pressure head, including hydraulic transients, on the pipe shall not exceed the values listed in Tables 1 and 2 for the specific pipe material.

TABLE 1 – WELDED IRRIGATION TUBING

Outside Diameter	Minimum Wall Operating Thickness	Pressure
6 inch	0.051 inch*	98 psi
6 inch	0.058 inch	108 psi
8 inch	0.064 inch	92 psi
10 inch	0.064 inch	73 psi
12 inch	0.064 inch	69 psi

*Alloy 5050

TABLE 2 – SEAMLESS EXTRUDED IRRIGATION PIPE

Outside Diameter	Minimum Wall Operating Thickness	Pressure
6 inch	0.058 inch	115 psi
8 inch	0.064 inch	96 psi
8 inch	0.072 inch**	108 psi
10 inch	0.064 inch	77 psi
10 inch	0.094 inch**	112 psi

** ASTM 6063-T6

Friction losses. For design purposes, friction head losses shall be no less than those computed by the Hazen-Williams Equation, using a roughness coefficient "C" as follows for the given pipe joint length:

Pipe Joint Length	C" Value
20 Ft	125
30 Ft	130
40 Ft	132
50 Ft	134

Flow velocity. The design velocity at system capacity shall not exceed 5 ft/sec on pipelines with valves or other flow control appurtenances placed along or at the end of the pipeline unless a surge analysis is completed.

Capacity. The design capacity of the pipeline shall be based on whichever of the following criteria is greater:

1. The capacity shall be sufficient to deliver the volume of water required to meet the irrigation demands of the crop(s) to be irrigated.
2. The capacity shall be sufficient to provide an adequate irrigation stream for the method(s) of irrigation being used.

Vents. Vents shall be designed to allow for the removal and re-entry of air as needed on open to the atmosphere pipelines with full pipe flow and on partial flow pipelines when the design water depth exceeds 70 percent of the pipe diameter. Vents shall be located at the upstream end of the pipeline, at high points along the pipeline, at points where there are changes in grade along the pipeline of 10 degrees or more or at a maximum spacing of 1320 feet along the length of pipelines not having other outlets open to the atmosphere. Vents shall be sized a minimum of 1/4 of the diameter of the pipeline. Vents shall have a minimum freeboard of one (1) foot above the hydraulic grade line. Where the use of open stands is impractical, air-vacuum release valves may be used in lieu of open vents. Valves shall be placed on top of a collection chamber that is no less than 1/2 the diameter of the pipeline. The chamber shall extend a minimum of one (1) foot above the top of the pipeline. Valves shall be designed using applicable manufacturer's rating curves for air removal with a maximum head loss of two (2) psi across the orifice of the respective valve. The valve shall be sized to remove air at a rate of no less than the larger of the pipeline design water capacity or the water flow rate during the filling of the pipeline.

Outlets. Appurtenances required to deliver water from the pipeline to an individual sprinkler or to a lateral line of sprinklers or surface pipe located on the ground surface are defined as outlets. Outlets shall have adequate capacity to deliver the design flow at the design operating pressure.

Check Valves. A check valve shall be installed between the pump discharge and the pipeline where a reversal of flow may occur. Anti-siphon devices shall be designed on pipelines that convey chemicals, pesticides or animal waste. Such devices shall meet the requirements of the Idaho State Department of Agriculture.

Pressure-relief valve. A pressure-relief valve shall be installed upstream of any in-line gate, butterfly valve or other type of in-line valve. Pressure-relief valves shall be installed on the discharge side of any check valve and in-line valve where a reversal of flow may occur and at pipeline ends if needed to relieve surge at the end of the line. Pressure-relief valves shall be no smaller than 1/4-inch nominal size for each inch of the pipeline diameter and shall be set to open at a pressure no greater than 5 lb/in^2 above the rated pressure of the pipe. Pressure-relief valves should be large enough to pass the full pipeline discharge with a pressure no greater than 50 percent above the pressure rating of the pipe. The pressure at which the valves start to open shall be marked on each pressure-relief valve. Manufacturers of pressure-relief valves marketed for use under this standard shall provide capacity tables, based upon performance tests, which give the discharge capabilities of the valves at the maximum permissible pressure and differential pressure settings. Such tables shall be the basis for design of pressure setting and acceptance of a valve.

Air-release valves. The three basic types of air-release valves used under this Practice Standard are described as follows:

1. An air-release valve. A continuously acting valve that has a small venting orifice, generally ranging between 1/16 and 3/8 inch in size. This valve releases pockets of air

from the pipeline once the line is filled with water and working under pressure.

2. An air-and-vacuum valve. Sometimes called air-vacuum-release valve or an air-vent-and-vacuum relief valve, this valve has a large venting orifice and exhausts large quantities of air from the pipeline during filling. It allows air to reenter the line and prevents a vacuum from forming during emptying of the pipeline. This valve does not allow further escape or release of air once the valve closes.
3. A combination air valve. Sometimes called combination air-release and air-vacuum valve or combination air-and-vacuum-relief valve, it is continuously acting and combines the functions of both the air-release valve and the air-and-vacuum valve in one valve body.

Air-and-vacuum valves or combination valves shall be installed at all summits, at the entrance and at the end(s) of pipelines when needed to provide a positive means for air escape during the filling and air entry during the draining of the pipeline. Such valves generally are needed at these locations if the line is closed to the atmosphere and there are no other features such as permanently located sprinkler nozzles or other unclosed outlets to adequately vent the particular location during filling and emptying operations.

The diameter of the most restrictive part of the air-vacuum valve or the large orifice of the combination air valve shall be equal to or greater than 15 percent of the inside diameter of the pipe to which it is attached. The minimum size shall be 1/2 inch in diameter. On larger pipes, this requirement can be met by installing more than one valve at a given location in a manifold arrangement provided the sum of the valve diameters exceeds 15 percent of the pipe diameter to which it is attached. Air-release valves or combination air valves shall be used as needed to permit air to escape from the pipeline while the line is working at pressure. The small orifices in these valves shall be sized according to the manufacturer's recommendations for the applicable working pressure and pipe size. Air-release and air-vacuum valves shall be installed in conjunction with in-line valves to allow the removal or entry of air as required on each side of the valve in an open or closed position.

Manufacturers of air valves marketed for use under this standard shall provide dimensional data which shall be the basis for the selection and acceptance of these valves.

Thrust Control. Thrust control shall be provided as needed at points where the horizontal or vertical alignment change is 5 degrees or greater, at tees, pipe reductions, dead ends and at in-line control gates. Adequate anchorage shall be provided on pipelines on slopes of 45 degrees and greater.

Thrust blocks shall be large enough to withstand the forces tending to move the pipe including those of momentum and pressure as well as forces due to expansion and contraction. The pipe manufacturer's recommendations regarding thrust control shall be followed.

Joints and connections. All connections shall be designed to withstand the maximum working pressure of the pipeline without leakage and to leave the inside of the pipeline free of any obstruction.

A dielectric connection shall be placed between any pump and the pipeline.

Fittings and appurtenances. Standard fittings shall be used when available. Elbows, tees, reducers, and valves shall equal or exceed the pressure rating of the pipe on which they are used.

Draining and flushing. Provisions shall be made for completely draining the pipeline where freezing is a hazard. Drains will be provided at low points along the pipeline as needed.

Pipeline placement. The pipe shall lay with continuous contact to the ground except designed supports may be used to span rock outcrops or ditches. The pipe shall be protected from hazards imposed from traffic and livestock.

Materials. Tubing for the pipe shall equal or exceed the requirements specified for drawn,

extruded and welded tubing in one of the following ASTM Standard Specifications.

- B 210 Aluminum and Aluminum-Alloy Drawn Seamless Tubes
- B 241 Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Alloy
- B 313 Aluminum and Aluminum-Alloy Rounded Welded Tubes

Certification and guarantee. The installing contractor shall certify that his/her installation complies with the requirements of this standard. The Contractor shall furnish a written guarantee that protects the owner against defective workmanship and materials for a period of not less than 1 year. The certification shall identify the pipe manufacturer and markings on the pipe being supplied.

CONSIDERATIONS

Pipelines should be tested for leaks and all leaks should be repaired.

Consider effects on the water budget, especially on volumes and rates of runoff to downstream water users.

Consider the effects on wetlands and water related wildlife.

Consider effects on water flows and aquifers and the affect to other water uses and users.

Consider the potential effect on irrigation water management.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared to show site specifics. The drawings and specifications shall show pipe location, pipe type and sizes, details for appurtenances, pipe bedding or support requirements as applicable.

OPERATION AND MAINTENANCE

The operation and maintenance of the system shall include typical items of flushing and draining pipeline, checking air vents, etc.

REFERENCES

-Engineering Field Manual

Chapter 3, Hydraulics

Chapter 15, Irrigation

-NRCS Conservation Practices

Structure for Water Control (587)

Irrigation System, Surface and Subsurface (443)

Irrigation System, Sprinkler (442)